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Modulated magnetic structures at T=0 in the heavy electron compounds YbPtIn and YbPtAl

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Due to the Kondo singlet ground state, the T=0 magnetic structure in Ce- or Yb-based heavy electron compounds can show anomalous features, forbidden for normal Kramers ions, such as a non-square moment modulation or the presence of zero moment ions, in the so-called antiferro-para (AFP) phase. A few examples of T=0 modulation or of finite temperature AFP have been found in Ce-based compounds (respectively in $CePb_3$ and CeSb for instance). However, up to now, these features have not yet been probed directly at the $4f$ site at T=0. We report here on our findings, close to T=0 and in zero magnetic field, of a commensurate AFP phase in the heavy electron compound YbPtIn, and of a non-square modulated incommensurate phase in YbPtAl. Our results come from ^{170}Yb Mössbauer spectroscopy in the 50 mK range and from neutron scattering. In hexagonal YbPtIn, the Mössbauer data can be interpreted in terms of a magnetic structure of the type ($\uparrow\downarrow$ 0). In line with this, the magnetic neutron diffraction data at 0.4 K can be indexed with a commensurate wave-vector $\mathbf{k}$=(0,0,$\frac{1}{3}$). The Mössbauer spectra also show also that the high temperature magnetic phase (1.4 K $< T <$ 3.5 K) in YbPtIn is a phase with weak moments ($\simeq$0.1 μ_B). In orthorhombic YbPtAl, the T=0 non-antiphase incommensurate moment modulation presents sizeable third and fifth Fourier harmonics which could be determined from the Mössbauer data.